A COMPARATIVE STUDY ON THE EFFECTIVENESS OFMULLIGAN'S ROTATION MOBILIZATION WITH MOVEMENT VERSUS DEEP HEATING MODALITY ALONG WITH QUADRICEPS EXERCISEIN THE MANAGEMENT OF OSTEOARTHROSIS KNEE SUBJECTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

(ELECTIVE – ADVANCED PT IN ORTHOPAEDICS)

To

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CERTIFICATE

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DEGREE OF "MASTER OF PHYSIOTHERAPY"

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DECLARATION

I hereby declare and present my thesis work entitled **“ A COMPARATIVE STUDY ON EFFECTIVENESS OF MULLIGAN’S ROTATIONMOBILIZATION WITH MOVEMENTVERSUS DEEP HEATING MODALITY ALONG WITH QUADRICEPS EXERCISES IN THE MANAGEMENT OF OSTEOARTHROSIS KNEE SUBJECTS”.**

And also state that the material of this project work has not formed on the basis for the award of any other degree previously from the Tamil Nadu Dr. M. G. R. Medical University, Chennai.

The outcome of original research work undertaken and carried out by me, under the guidance ofProf. Mr. M. K. Franklin Shaju, M. P. T., M. S. P. T., (Ph. D.), R.V.S. College of Physiotherapy,Sulur, Coimbatore.

Place: SIGNATURE

Date:

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I INTRODUCTION

Osteoarthrosis is a common musculoskeletal problem that is mostly affects cartilage. Cartilage is the slippery tissue that covers the ends of bones in a joint. Healthy cartilage allows bones to glide over each other. It also helps absorb the shock of movement. In Osteoarthrosis, the top layer of cartilage breaks down and wears away. This allows the bones under the cartilage to rub together. The rubbing causes pain, swelling and decrease in range of motion of the joint. Over time, the joint may lose its normal shape. Also, bone spurs may grow on the edges of the joint. Bits of bone or cartilage can break off and float inside the joint space, which causes more pain and damage. People with Osteoarthrosis often have joint pain and reduced motion. Its affects only joints and not the internal organs.

Osteoarthrosis occurs most often in older people. Younger people sometimes get Osteoarthrosis, primarily due to joint injuries. Osteoarthrosis usually happens gradually over time. Some risk factors that might lead to it include, being overweight, due to old age, joints that are not properly formed, a genetic defect in joint cartilage, stresses on the joints from certain jobs and playing sports, estrogen deficiency appears to be a factor in postmenopausal women. Joints affected most commonly are the hip, knee, and inter phalange joints. Signs of Osteoarthrosis are stiffness in a joint after getting out of bed or sitting for a long time, swelling or tenderness in one or more joints, a crunching feeling or the sound of bone rubbing on bone also are signs of osteoarthrosis.

No single test can diagnose Osteoarthrosis. Healthcare professionals use several methods to diagnose the disease and rule out other problems. They are Medical history, Physical examination, X rays, other tests such as blood tests or

examination of the fluid in the joints. Current physical therapy management often combines treatments to fit to a patient's needs, lifestyle, and health.

Osteoarthrosis treatment has four main goals

- Improve joint function
- Keep a healthy body weight
- Control pain
- Achieve a healthy lifestyle

Osteoarthrosis treatment plans can involve:

- Exercise
- Weight control
- Rest and joint care
- Nondrug pain relief techniques to control pain
- Medicines
- Complementary and alternative therapies
- Surgery

Three kinds of programs help people learn about Osteoarthrosis and self-care and improve their good-health attitude. They are

1. Patient education programs
2. Arthritis self-management programs
3. Arthritis support groups

These programs teach people about Osteoarthrosis and its treatments. They also have clear and long lasting benefits. People in these programs learn to: Exercise and relax, Talk with their doctor or other health care providers and Solve problems.

People with Osteoarthrosis find that self-management program help them to understand the disease, reduce pain while staying active, cope with their body, mind, and emotions and also to have more control over the disease, live an active, independent life.

People with good-health attitude, focus on what they can do, not what they can't do. Focus on their strengths, not their weaknesses. Breakdown activities into small tasks those are easy to manage. Build fitness and healthy eating into their daily routines. Develop ways to lower and manage stress. Balance rest with activity and develop a support system of family, friends, and health care providers. Research is being done on Osteoarthrosis as it is not a simply a disease of "wear and tear" that happens in joints as people get older. There is more to the disease than aging alone.

Researchers are studying, Tools to detect Osteoarthrosis earlier, Genes, Tissue engineering – special ways to grow cartilage to replace damaged cartilage, A wide range of treatment strategies is also in consideration for e.g. Medicines to prevent slow down, or reverse joint damage, Complementary and alternative therapies, Vitamins and other supplements, Education to help people manage their Osteoarthrosis better, Exercise and weight loss as ways to improve mobility and decrease pain. Physical therapy management for knee Osteoarthrosis is aiming to reduce pain and functional performance. Few studies have investigated the effectiveness of manual therapy in patients with knee Osteoarthrosis.

Mulligan's Mobilization with Movement is a manual therapy treatment technique that is used in the management of various musculoskeletal conditions. Mulligan proposed that a minor positional fault of joint results in movement restriction and pain. Treatment technique is, while the therapist applies a sustained

accessory glide at right angles or parallel to a joint, the patient moves the joint actively. The aim of the Mulligan's Mobilization with Movement technique is to restore a painless and full range functional movement of a joint from a painful and limited joint movement. To date, most of the Mobilization with Movement studies emphasize on spine, upper extremities and ankle. Most of the results revealed that Mobilization with Movement technique effectively reduces pain and increases range of motion. The purpose of this study therefore was to compare the effectiveness of Mobilization with Movement technique on pain, stiffness and functional performance in subjects with unilateral Osteoarthrosis knee.

Deep heating modalities are in various forms and they are several means of application of energy and materials to patients. Different thermal agents produce the greatest change in temperature in different types and areas of tissue. Diathermy is the ideal therapeutic heating modality which increases circulation, accelerates healing, controls pain and increases soft tissues extensibility. Diathermy is the only way to heat large deeper areas. This therapeutic heating causes vasodilatation, increases the rate of enzymatic biological reaction, increases nerve conduction velocity and increases soft tissue extensibility.

Shortwave diathermy is therapeutic electromagnetic device commonly used in physiotherapy practice with an operating frequency 27.12 MHz, which sets radio waves with a wave length of 11m (foser and palastanga 1992). Diathermy converts electromagnetic energy in to heat thus making it a deep heating modality. It is capable of heating tissues to depth of 3 to 5 cm from the skin surface. Shortwave diathermy has physiological effects of pain relief and resolution of inflammation. It also induces muscle relaxation and increases joint flexibility, vascular supply and sedation.

Exercise is important in Osteoarthrosis management. In Osteoarthrosis of knee the person complaints of pain in the joint and hence there is restriction of movements in the knee joint thus leading to atrophy of muscles. It seems that supervised exercise sessions are superior to home exercise for pain reduction. Based on studies showing a weaker quadriceps will increase the risk of developing knee Osteoarthrosis. So strengthening the weakened quadriceps with active exercise will prevent knee Osteoarthrosis. Exercise helps in pain relief, maintaining stability of joint controls the effusion and improves the blood supply to the joint structures. During exercise there is release of endogenous opiates which thus relieves pain and improves muscle power.

1.1 NEED OF THE STUDY

There are many protocols in the treatment of Osteoarthrosis in knee joint. The need of the study is to compare whether the Effectiveness of Mulligan's Rotation Mobilization with Movement (MWM) or Deep Heating Modality i.e. Shortwave Diathermy along with Quadriceps exercises is useful in the intervention in the management of Osteoarthrosis of knee joint.

1.2. OBJECTIVE OF THE STUDY

- To determine the Effectiveness of Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises in the management of knee Osteoarthrosis.
- To determine the Effectiveness of Deep Heating Modality along with Quadriceps exercises in the management of knee Osteoarthrosis.
- To Compare Effectiveness of Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises Versus Deep Heating Modality

along with Quadriceps exercises in the management of Osteoarthrosis knee subjects.

1.3. STATEMENT OF THE PROBLEM

A comparative study on Effectiveness of Mulligan's Rotation Mobilization with Movement versus Deep Heating Modality along with Quadriceps exercises in the management of Osteoarthrosis knee subjects.

1.4. HYPOTHESIS

1.4.1. Null Hypothesis

- H_{01} There is no significant difference in Pain following Mulligan's Rotation Mobilization with Movement and Deep Heating Modality along with Quadriceps exercises among Osteoarthrosis knee subjects.
- H_{02} There is no significant difference in Knee Function following Mulligan's Rotation Mobilization with Movement and Deep Heating Modality along with Quadriceps exercises among Osteoarthrosis knee subjects.

1.4.2. Alternate Hypothesis

- H_{A1} There is significant difference in Pain following Mulligan's Rotation Mobilization with Movement and Deep Heating Modality along with Quadriceps exercises among Osteoarthrosis knee subjects.
- H_{A2} There is significant difference in Knee Function following Mulligan's Rotation Mobilization with Movement and Deep Heating Modality along with Quadriceps exercises among Osteoarthrosis knee subjects.

1.5. OPERATIONAL DEFINITIONS

Mobilization with Movement

Brian Mulligan's concept of mobilizations with movement (MWM) is the logical continuance of this evolution with the concurrent application of both therapist applied accessory movement and patient generated active physiological movements.

Deep Heating Modalities

Deep heating modalities are various forms and means of applying of energy and materials to patients. Energy transfer or heat by physical modalities typically occurs by one of three processes, they are conduction, convection and conversion. The conduction is heat energy is transferred by contact from the object of highest energy to the object of lowest energy. The convection is the process of heat energy transfer between a solid object and a moving gas or liquid. The conversion is the process of energy transfer that involves converting one form of energy to a different form. Use of high frequency sound waves or electromagnetic waves is to heat tissues. They are shortwave diathermy, microwave diathermy and ultrasound therapy.

Shortwave Diathermy (SWD)

It is a high frequency current, generated by an oscillator circuit that allows electrons to oscillate at a frequency of 27.12 MHz with wavelength of 11m.

Quadriceps Exercise

Patients with knee Osteoarthrosis have a significant decrease in the strength of quadriceps muscle and control. Pain is strongly associated with decreased quadriceps strength even in a very early joint degeneration. It has been suggested that quadriceps weakness is a risk factor for osteoarthrosis.. Therapeutic exercise is a form of physical activity that is provided under the supervision of appropriate health professionals for specific treatment goals.

Osteoarthrosis

Osteoarthrosis [osteo – bone +Gr. *Arthron* joint + *osis* degeneration]. Osteoarthritis is a degenerative condition and therefore is most appropriately termed “osteoarthrosis”. Osteoarthrosis otherwise called degenerative joint disease or hypertrophic arthritis. It is a non inflammatory condition mainly affecting weight bearing joint.

Pain

Pain has been defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Knee Function

Function is defined as to fulfill the purpose or task of a specified thing. Knee functions are walking, running, stooping, stair climbing up and down, and stand, kneel on front of your knee, squat, sit with your knee bent, rise from chair, run straight ahead, jump and land on your involved leg, stop and start quickly.

II REVIEW OF RELATED LITERATURE

SECTIONS

Section A: Studies on Effect of Mulligan's Rotation MWM (Mobilization with Movement) in patients with Osteoarthrosis of knee joint.

Section B: Studies on Effect of Deep Heating Modality in patients with Osteoarthrosis of knee joint.

Section C: Studies on Effect of Quadriceps Exercise in patients with Osteoarthrosis of knee joint.

Section D: Studies on Reliability and Validity of Visual Analogue scale in measuring pain.

Section E: Studies on Reliability and Validity of Western Ontario McMasters Universities Osteoarthritis index (WOMAC).

Section A

Studies on Effect of Mulligan's Rotation MWM (Mobilization with Movement) in patients with Osteoarthrosis of knee joint.

Sambandam and Sailo (2011) Described that osteoathrosis is the most common joint disease causing disability, current physical therapy management for osteoarthrosis knee is aiming to increase range of motion and functional performance. The purpose of the study is to find out the effectiveness of mobilization technique either Maitland or mulligan's mobilization with movement for improving unilateral osteoarthrosis knee pain. The purpose of this study is find out effective of Mulligan shows great improvement than Maitland mobilization. They improve range of motion and increase functional performance.

Dimitrova et al. (2008) conducted a study to provide evidence based recommendations for prescription of MWM. This study demonstrated that strengthening of knee musculature was more effective after the MWM and was associated with significant improvement in quadriceps strength and function, when compared with controls in effective in reducing pain and improving function in individuals diagnosed with knee osteoarthrosis.

Paungmalia and Teys (2007) Explain that P. Mulligan's Mobilization with Movement (MWM) is a manual therapy treatment technique that is used in management of various musculoskeletal conditions. Most frequent reported effect is that of an immediate and substantial pain reduction accompanied by improved function.

Vicenzino and Smith (2006) Suggested that MWM technique is to restore a painless and full range functional movement from a painful and limited movement. To date, most of MWM studies emphasize on spine, upper extremities and ankle.

Hing et al. (2006) conducted a study to evaluate the overall efficiency of MWM. This study found significant positive result with mobilization with movement applications, when compared to placebo or control group. The most common significant result found was increased in strength, reduction in pain levels.

Steultjens et al. (2004) Reported that the major causes of range of motion limitation of arthritis knee are joint pain and weakness of quadriceps muscle with these regards and suggested that utilizing MWM to neutralize the knee joint alignment and to reduce pain may have a higher priority than strengthening the quadriceps muscle in clinical practice.

Jackmiller (1999) state that Brian Mulligan's concept of Mobilization with Movement (MWM) is the concurrent logical application of a sustained accessory mobilization applied by a therapist and an active physiological movement to end range applied by the patient. Passive end-of-range overpressure, or stretching, is then able to be delivered without pain as a barrier. The techniques are always applied in a pain-free direction and are described as correcting joint tracking from a positional fault.

Section B

Studies on Effect of Deep Heating Modality in patients with Osteoarthrosis of knee joint.

Recovery physical therapy (2013) Exceptional physical therapy and Rehabilitation services in Man hattan, queens, West Chester and New jersey

concluded that Local ‘superficial heating’ is recommended in sub acute conditions for reducing pain, increasing tissue elasticity and promoting healing of injured tissue. The basic application of heat are simple and effective ways to relieve joint pain and reduce swelling associated with injury, reduce muscle spasms, increase flexibility of tight skeletal muscles.

Laufer and Dar (2012) mentioned that Knee osteoarthrosis is one of the most common forms of arthritis. The primary impairments associated with knee includes pain, stiffness, joint instability, joint swelling and muscle weakness. These impairments result in marked functional limitations in housekeeping and functional ability of life. This study concluded that thermal effects of shortwave diathermy treatment appears to be effective for decreasing pain and increasing muscle strength in knee osteoarthrosis.

Yue foundation health blog (2010) said that Energy transfer or heat by physical modalities typically occurs by one of three processes. They are conduction, convection and conversion. Conduction is heat energy is transferred by contact from the object of highest energy to the object of lowest energy. Convection is the process of heat energy transfer between a solid object and a moving gas or liquid. Conversion is the process of energy transfer that involves converting one form of energy to different form. Use of high frequency sound waves or electromagnetic waves is to heat tissues. They are SWD, MWD and Ultrasound.

Yue foundation Therapeutic Heat Health Blog (2010) concluded that, in shortwave diathermy tissue warming produced by two processes. They are, Resistive heating and Degradation of molecular oscillatory motions that electromagnetic waves induce when they interact with tissues. SWD is dominant electromagnetic diathermy in sports medicine, albeit relatively rarely used in comparison of other heating

modalities. Most devices operated at 27.12 MHz the U.S. federal communications commission also approves frequencies of 13.56 MHz and 40.68 MHz for use.

Jan et al. (2006) in this study they attempted to quantify the thickness of synovial sac and pain index before and after application of shortwave diathermy for patients with knee osteoarthrosis. The results of this study showed that the application of shortwave diathermy in patients with knee osteoarthrosis can significantly reduce both synovial thickness and knee pain. Such reductions of synovial sac thickness and pain index continue with increases in treatment sessions. So the shortwave diathermy can be used to improve vascular circulation and reduce inflammation and pain for patients with knee osteo Arthrosis.

Cameron (2003) in his text Physical agents in Rehabilitation second edition he mentioned that Diathermy - The ideal therapeutic heating modality in which therapeutic heat can increase circulation, accelerate healing, control pain and increase soft tissue extensibility. Diathermy is the only way to heat large deep areas. The heating cause's vasodilatation increases the rate of enzymatic biological reactions, increase nerve conduction velocity and increase soft tissue extensibility.

Goats (1989) concluded that continuous shortwave diathermy is the technique of choice when uniform marked elevation of temperature is required in deep tissues. This heating can be targeted accurately by suing an appropriated applicator positioned correctly. SWD also allows superficial structures to be heated selectively, although for this the various methods of surface heating are usually preferable. Sub acute or chronic conditions respond best in SWD. It also helps to prevent pain, muscle spasm, resolve inflammatory state and reduce swelling, promote vasodilatation, increase the compliance of connective tissue, increase joint range and decrease joint stiffness.

Section C

Studies on Effect of Quadriceps Exercises in patients with Osteoarthrosis of knee joint.

Lin et al. (2012) concluded that Patients with knee OA often experience pain and problems in activities involving the lower limb (e.g., walking) or prolonged positioning (e.g., sitting), as well as stiffness after a night's sleep. Exercise can target these specific deficits. Knee OA also is a potentially deteriorating condition without a curative treatment. Therefore, patients with knee OA are likely to benefit from exercise in managing this long-term condition. It is the physical therapist's role to prescribe appropriate exercises to suit a patient's goals, lifestyle, and overall health condition and ensure that the exercise program is progressive and challenging in order to deliver benefits. The benefits of exercise are contingent on a patient's adherence to the exercise program. Evidence to date shows that, although exercise has short-term benefits in reducing pain and improving physical function, these benefits may not persist in the long term without adherence to the exercise program. Therefore, strategies to increase long-term adherence to exercise, such as adding in booster sessions, may be necessary to maximize the benefits of exercise for people with knee OA.

Iwamoto et al. (2011) they said conservative treatment is advocated in patients with mild to moderate osteoarthrosis of knee. Because muscle weakness is associated with pain and physical dysfunction and influences the progression of the disease in patients with osteoarthrosis of knee joint. Muscle strengthening is a key component of the knee OA. It has been shown that muscle strengthening and aerobic exercises are effective in reducing pain and improving physical function in patients with mild to moderate osteoarthrosis of knee.

Alghamdi et al. (2004) state that the main purpose of this article was to discuss the concept of exercise in the intervention for OA disease. Studies suggest that the exercise effect should be examined at three levels, namely at the level of the joint, at the joint as a functional unit and at the level of whole body systems. The literature on exercise in OA concludes that exercise is beneficial in reducing pain, improving strength, improving function and reducing disabilities associated with osteoarthrosis.

Berenbaum (2004) concluded that Quadriceps muscle weakness is one of the risk factors for developing osteoarthrosis in knee joint.

Oatis (2004) explained the current physical therapy management for knee osteoarthrosis is aiming to reduce pain and improve functional performance. They can influence the responsiveness of patients with knee osteoarthrosis to exercise and physical activity program to enhance the benefit of rehabilitation.

Michael et al. (2001) Said that quadriceps weakness is the common in patients with knee osteoarthrosis and has been attributed to failure of voluntary activation.

Section D

Studies on Reliability and Validity of Visual Analogue Scale in measuring pain

Breivik1 et al. (2008) concluded valid and reliable assessment of pain is essential for both clinical trials and effective pain management. The nature of pain makes objective measurement impossible. Acute pain can be reliably assessed, both at rest (important for comfort) and during movement (important for function and risk of postoperative complications), with one-dimensional tools such as numeric rating scales or visual analogue scales. Both these are more powerful in detecting changes in pain intensity than a verbal categorical rating scale. In acute pain trials, assessment of

baseline pain must ensure sufficient pain intensity for the trial to detect meaningful treatment effects. Chronic pain assessment and its impact on physical, emotional, and social functions require multidimensional qualitative tools and health-related quality of life instruments.

Jensen (2003) mentioned that Validity refers to the appropriateness, meaningfulness, and usefulness of a measure for a specific purpose. Validity is generally seen as the most important consideration in the evaluation of a measure. With respect to cancer pain measures, validity refers to the extent to which the measure(s) under question are valid and useful indicants of cancer pain or are useful predictors of important outcomes such as survival or quality of life. Reliability refers to the extent to which a score is free from errors of measurement. Many factors in addition to a patient's experience of pain could potentially influence his or her response to a pain measure or scale. Such factors might include the specific assessment setting (e.g. laboratory versus clinic), the person administering the measure (e.g., a research assistant, clinician, primary health care provider, or family member), other subjective experiences and feelings (e.g., being more or less fatigued or upset), or even motivational factors (e.g. desiring to appear stoic, desiring to communicate a need for analgesic medications). The VAS has consistently demonstrated sensitivity to changes in cancer pain associated with treatment or time and usually shows strong associations with other pain intensity ratings. The VAS also demonstrated present pain intensity and change in pain intensity in association with performance status, diagnosis, setting, psychological distress and global quality of life.

Chapman and Turner (2002) in this study they have described the flexible use of Visual/verbal Analogue Scales in the dental surgery. It takes very little time to

describe to the patient and seconds to use as a monitoring device during treatment. If used to address the individual's problems (fear/worry, fear of pain, fear of betrayal or lack of trust, poor self-esteem and few positive coping strategies) that should have been identified during history taking, the result is a far more accurate understanding of the patient's perceptions by the health professionals. In addition, the patient should feel better understood, less vulnerable and more cared for.

Section E

Studies on Reliability of Western Ontario McMasters Universities Osteoarthritis index (WOMAC):

Sodarman and Malchau (2000) they concluded the Swedish WOMAC Osteoarthritis Index measured what it was supposed to measure very well (high validity) and was also reproducible (high reliability). They recommend the Swedish WOMAC Likert score for studies after total hip Arthroplasty.

Wolfe and Kong (1999) mentioned about the advances in health measurement have led to the application of Rasch Item Response Theory (IRT) analysis (Rasch analysis) to evaluate instruments measuring health status and quality of life of patients, including the Health Assessment Questionnaire and SF-36. This study investigated the extent to which the WOMAC satisfies the Rasch model, particularly in respect to uni-dimensionality, items separation, and linearity. The WOMAC generally satisfies the requirements of Rasch item response theory across all disorders studied, and is an appropriate measure of lower body function in osteoarthritis, rheumatoid arthritis and fibromyalgia.

Woolacott et al. (1994) state that, the purposes of Meta analysis and network. Meta analysis the use of standard outcome measures is ideal. In the field of osteoarthritis research The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) was developed as osteoarthritis specific measure of disability. It comprises three components. They are pain, stiffness, physical function, which can be reported separately or as an overall index. In 1994 a consensus meeting recommended the use of WOMAC as a primary measure of efficacy in osteoarthritis trials.

Bellamy (1982) he is the Founder of WOMAC Osteoarthritis – An evaluative index for clinical trials. M.Sc., thesis. McMasters Universities. Hamilton, Canada. The WOMAC is one of the most widely utilized self report measures of lower extremity symptoms and function. It has been studied over a period of almost 30 years in many contexts and patient population. The WOMAC has been shown to distinguish well between patients with better vs. worse outcomes from mild to moderate knee pain. The WOMAC has been extensively used in the contexts of clinical trials. Overall studies have shown that the WOMAC pain, stiffness and function subscales exhibit comparable or greater responsiveness to change.

III METHODOLOGY

3.1. STUDY DESIGN:

Pre test Post test Experimental Design.

3.2. SAMPLING DESIGN:

Consecutive sampling.

3.3. STUDY SETTING:

This study was conducted at G. Viswanathan Hospital, Physiotherapy Out-Patient Department, Singarathope, Trichy and Tamil Nadu.

3.4. STUDY DURATION:

This study was conducted for a period of six weeks.

3.5. CRITERIA FOR SELECTION OF SUBJECTS:

Inclusion Criteria

- Medically directed unilateral early Osteoarthrosis subjects.
- Age between 45 and 55 years.
- Male subjects only.

Exclusion Criteria

- Severe pain in any other parts of the body other than the actual site.
- Bilateral Osteoarthrosis knee subjects.
- Deformity and contractures.
- Patients with upper or lower motor neuron lesions.
- Recent fracture.
- Soft tissue injury around knee.

- Limb length discrepancy.
- Obesity.
- Metabolic disorders.
- Hyper mobility
- Hyper sensitivity
- Large area loss of sensation
- Arterial insufficiency
- History of surgery around knee.
- Arthroplasty and any metal implantation.
- Un Co-operative patient.

3.6. VARIABLES

Independent variable

- Mulligan's rotation mobilization with movement (MWM) with Quadriceps exercise
- Deep Heating Modality i.e. Shortwave diathermy with Quadriceps exercise

Dependent variable

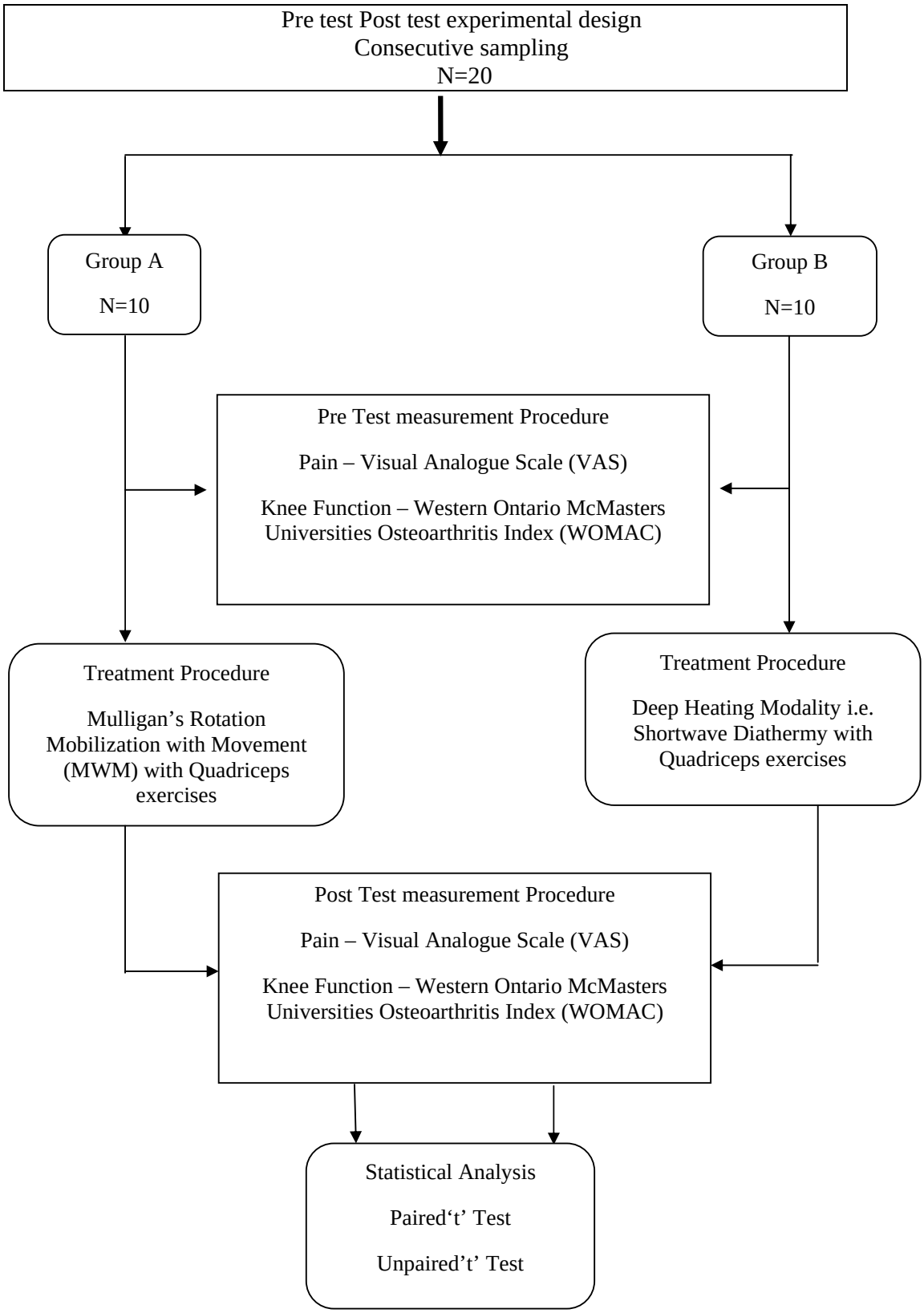
- Pain
- Knee Function

3.7. ASSESSMENT TOOL

- Visual Analogue Scale
- Western Ontario McMasters Universities Osteoarthritis Index

3.8. PROCEDURE

Figure: 1 Research Design Flow Chart



20 medically directed unilateral early osteoarthrosis subjects from physiotherapy outpatient department aged between 45 and 55years who fulfilled inclusion and exclusion criteria were selected by consecutive sampling method and randomly assigned to two groups of 10 subjects each as Group A and Group B. Group A assigned for Mulligan's Rotation Mobilization with Movement (MWM) along with Quadriceps exercises and Group B assigned for Shortwave Diathermy with Quadriceps exercises. Before and after intervention Pain and Knee Function were measured by Visual Analogue Scale and Western Ontario McMasters Universities Osteoarthritis Index respectively and recorded.

3.9.1 MEASUREMENT PROCEDURE

Pain by Visual Analogue Scale

A visual analogue scale of pain consists of a line, usually '0' to '10' cm or '0'to '100' mm long, with each end of the line labeled with descriptors representing the extremes of pain intensity (e.g. no pain, severe pain). Respondents place a mark on the line that represents his or her pain intensity level, and the distance measured from the "no pain" end to the mark is that person's VAS pain score. These are used as a Likert-type scale, being marked at the appropriate point by the patient with an 'X'.

Knee Function by Western Ontario McMasters Universities Osteoarthritis Index (WOMAC)

The Western Ontario McMasters universities (WOMAC) Osteoarthritis Index is a disease specific, tri-dimensional self administered questionnaire, for assessing health status and health outcomes in osteoarthrosis of the knee joint. Here we are using 5 point Likert version scale. They are none, mild, moderate, severe and extreme. They measured 0, 1, 2, 3 and 4 respectively. The questionnaire can be completed by

patient in five minutes. It is to assess pain, stiffness and physical function in patient with knee osteoarthrosis.

WOMAC consist of 24 items divided into 3 subscales.

Pain 5 items: during walking, using stairs, in bed, sitting or lying and standing.

Stiffness 2 items: after first walking and later in the day.

Physical function 17 items: stairs use, rising from sitting, standing, bending, walking, getting in and out of car, shopping, putting on / taking off socks, rising from bed, lying in bed, getting in / out of bath, sitting, getting on / off toilet, heavy house hold duties, light house hold duties. The disability is sum of all the index scores so highest score shows higher disability.

Both Group A and Group B subjects are involved in pre-test assessment by Visual Analogue Scale and Western Ontario McMasters universities Osteoarthritis Index scale.

3.9.2. TREATMENT PROCEDURE

Treatment Procedure:

Mulligan's Rotation Mobilization with Movement (MWM)

In this procedure patient asked to lie down in supine position. Now therapist grasps the lower leg and internally rotates the tibia on the femur. It is even better if the fibula is moved ventrally at the same time. Maintain this and have the patient flex. When indicated they will be able to flex further without pain. Therapist should apply overpressure through his hands following active knee flexion of the patient.

Repetition: six per set and three sets per session

Course of treatment: seven sessions in a period of two weeks.

Figure: 2

Mulligan's Rotation Mobilization with Movement for Right Osteoarthrosis knee patient

Shortwave Diathermy

In shortwave diathermy (SWD), high frequency current is used in a frequency of 27.12 MHz with wave length of 11m.

Position of patient: Supine lying.

Method: Contra planar.

Position of plate electrodes: Medial and Lateral

Intensity: 2

Mode: Continuous mode to obtain thermal effect in tissues.

Spacing: Medium spacing.

Treatment duration: 15 minutes per session.

Course of treatment: 7 sessions in two weeks.

Figure: 3

Shortwave diathermy Contra planar position for Osteoarthrosis knee patient

Quadriceps Exercise

The first basic exercise is the isometric setting of quadriceps muscles. Figure 4 (a) shows rolled towel or bed sheet kept under the patient knee asks the patient to contract the muscle. Each setting of muscle contraction is done to the count of five, and each stage of contraction is done 10 times. The patient is made aware of the tightening of his thigh muscles as his exercise.

The second exercise is straight leg rising, perform 10 times on the involve side alternately on each side. Figure 4 (b) shows that the patient contracts the Quadriceps as done in the isometric exercise. These with the knee in full extension, he slowly raises the leg to 45 degree and then slowly brings it down, maintaining the knee fully extended. This isotonic exercise strengthening the Quadriceps because it pulls up the extended leg against gravity

The third exercise is knee extension and flexion exercises from a high sitting position, Figure 4 (c) and (d) shows that a folded towel or bed sheet placed under the lower aspect of thigh. Now ask the patient to do knee extension and maintain for five counts and slowly return to the normal position. This should be repeated for ten times.

Figure: 4 (a) Static Quadriceps Exercise

Figure: 4 (b) Straight Leg Raise

Figure: 4 (c) Knee Extension in High Sitting

Figure: 4 (d) Knee Flexion in High Sitting

IV DATA ANALYSIS AND RESULTS

4.1. DATA ANALYSIS

The data collected from 20 subjects were evaluated statistically. Descriptive analytical study was done by using Paired‘t’ test and Unpaired‘t’ test.

a) **Paired ‘t’ test** $\bar{d} = \frac{\sum d}{n}$

$$S = \sqrt{\frac{\sum d^2 - \frac{\left(\sum d\right)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre test and post test values

—— Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Un paired ‘t’ test

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2 = Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-A

$\bar{x}_2$ = Mean of the difference in values between pre-test and post-test in Group-B

4.2. Data Analysis of Knee pain in Group A

Subjects in Group A were given Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises for seven days. Pre test, Post test scores were recorded and statistically analyzed as follows.

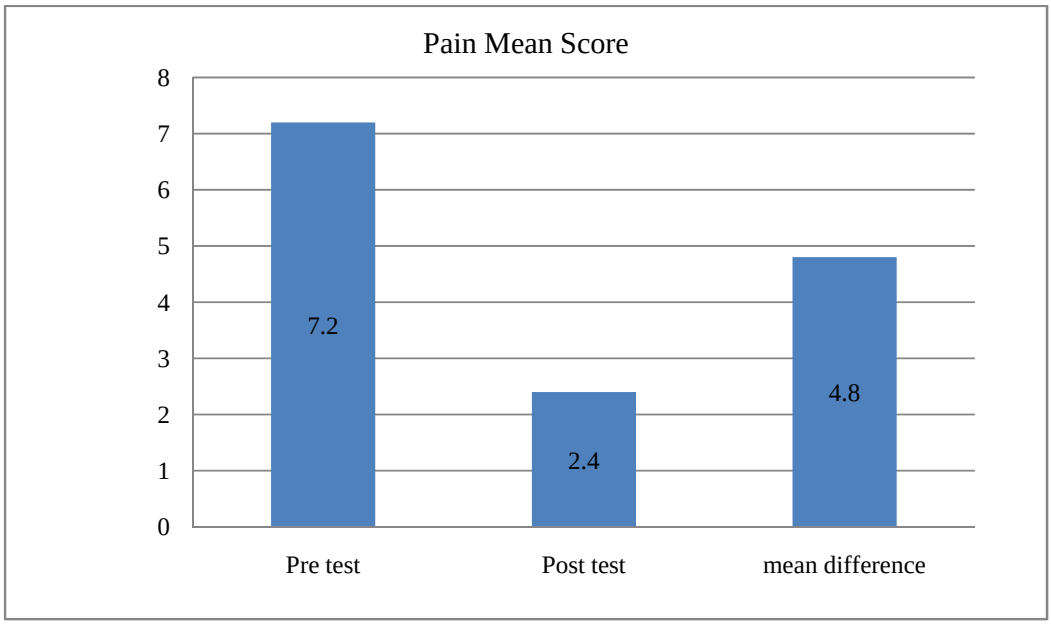
The mean, mean difference, standard deviation and paired 't' value on Pre test, Post test scores of Knee pain in Group A have been analyzed and presented in Table 1

Table 1:

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre test	7.2	4.8	0.9	17.20
Post test	2.4			

The calculated paired ‘t’ value for Knee pain in Group A is 17.20. The ‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated ‘t’ value is more than ‘t’ table value, there is significant difference in Pre and Post test scores of Group A. Thus there is significant reduction in pain following Mulligan’s Rotation Mobilization with Movement along with Quadriceps exercises among Osteoarthrosis knee pain subjects.

Figure: 5 Graphical representation of Pre test Mean, Post test Mean and Mean Difference score of Knee pain in Group A



4.3. Data Analysis of Knee pain in Group B:

Subjects in Group B were given Shortwave Diathermy with Quadriceps Exercise for seven days. Pre test and Post test scores were recorded and statistically analyzed as follows.

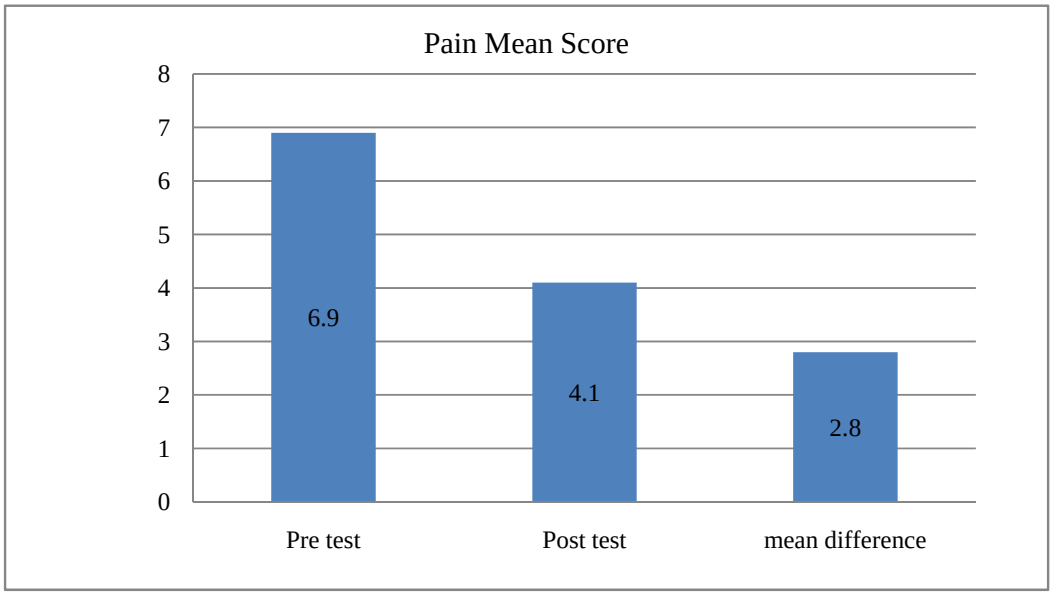
The Mean, Mean Difference, Standard deviation and Paired ‘t’ value on Pre test, Post test scores of Knee pain in Group B have been analyzed and presented in Table 2.

Table: 2

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pre test	6.9	2.8	0.7	12.64
Post test	4.1			

The calculated paired ‘t’ value for Knee pain in Group B is 12.64. The‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated ‘t’ value is more than ‘t’ table value, there is significant difference in Pre and Post test scores of Group B. Thus there is significant reduction in pain following Shortwave Diathermy with Quadriceps exercises among Osteoarthrosis knee pain subjects.

Figure: 6 Graphical representation of Pre test Mean, Post test Mean and Mean Difference score of Knee pain in Group B



4.4. Data Analysis of Knee Pain of Group A and Group B

Subjects in Group A and Group B were given Mulligan's Rotation Mobilization with Movement along with Quadriceps Exercise and Shortwave Diathermy with Quadriceps exercise respectively for seven days and Pre-test, Post-test scores were recorded and statistically analyzed as follows.

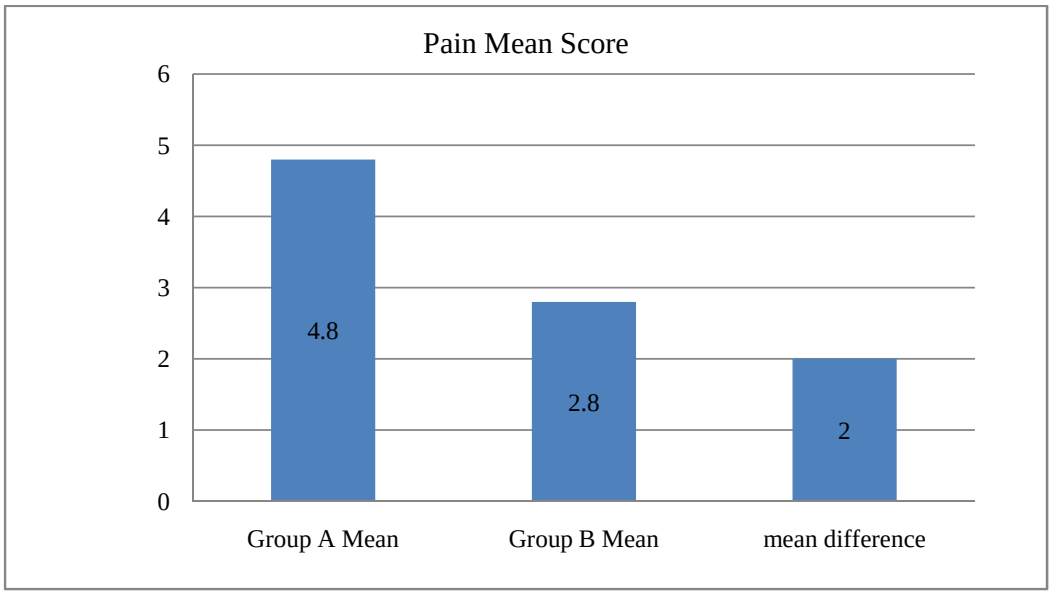
The Mean, Mean Difference, Standard Deviation and Unpaired 't' values of Knee pain in Group A and Group B have been analyzed and presented in Table 3

Table: 3

Serial No	Groups	Improvement		Standard Deviation	Unpaired 't' test
		Mean	Mean Difference		
1.	Group A	4.8	2	0.85	5.525
2.	Group B	2.8			

The calculated Unpaired ‘t’ value for Knee pain of Group A with Group B is 5.525. The Unpaired ‘t’ table value is 2.878 at 0.005 level of significance. Since the calculated Unpaired ‘t’ value is more than ‘t’ table value, there is significant difference in Knee pain score of Group A with Group B. Thus there is significant difference between Group A and Group B in reducing Knee pain among Osteoarthrosis knee subjects.

Figure: 7 Graphical representation of Mean and Mean difference of Knee pain values of Group A and Group B.



4.5. Data Analysis of Knee Function in Group A

Subjects in Group A were given Mulligan’s Rotation Mobilization with Movement along with Quadriceps exercises for seven days. Pre test, Post test scores were recorded and statistically analyzed as follows.

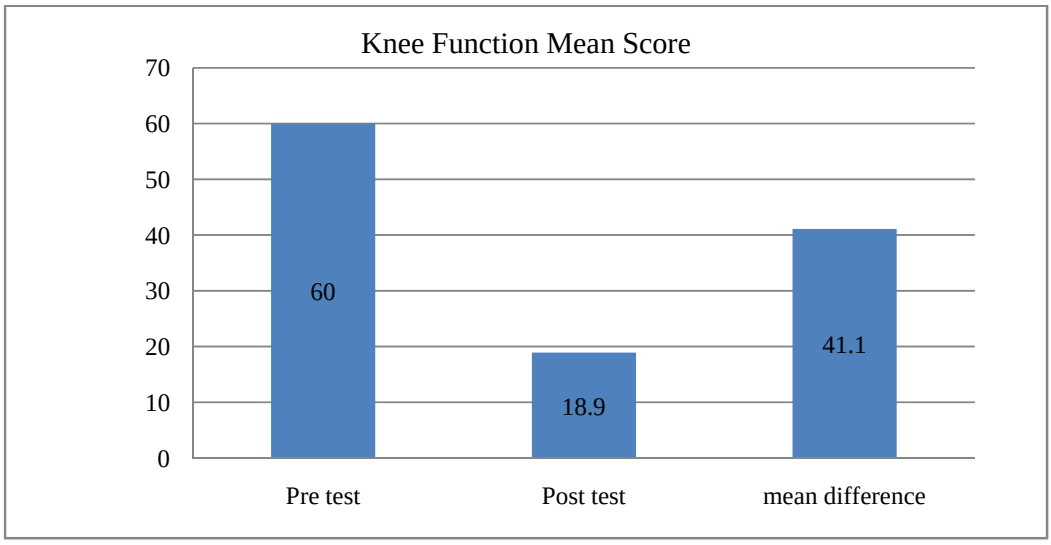
The mean, mean difference, standard deviation and paired ‘t’ value on Pre test, Post test scores of Knee Function in Group A have been analyzed and presented in Table 4.

Table 4:

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre test	60	41.1	11.17	11.62
Post test	18.9			

The calculated Paired 't' value for Knee Function in Group A is 11.62. The 't' table value is 3.250 at 0.005 level of significance. Since the calculated paired 't' value is more than't' table value, there is significant difference in Pre and Post test scores of Group A. Thus there is significant improvement in knee function following Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises among Osteoarthrosis knee pain subjects.

Figure: 8 Graphical representation of Pre test Mean, Post test Mean and Mean Difference score of Knee Function in Group A



4.6. Data Analysis of Knee Function in Group B

Subjects in Group B were given Shortwave Diathermy with Quadriceps Exercise for seven days. Pre test and Post test scores were recorded and statistically analyzed as follows.

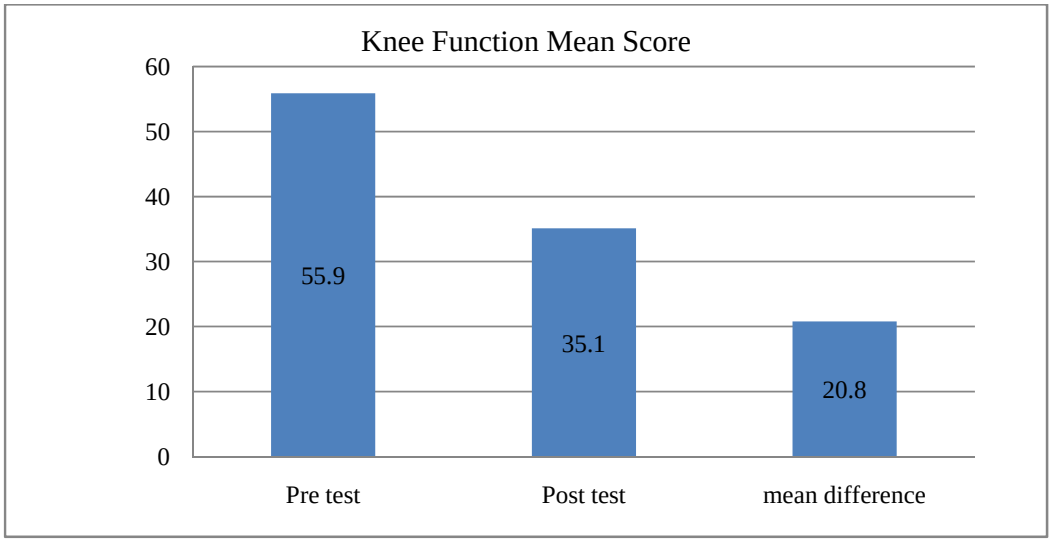
The Mean, Mean Difference, Standard deviation and Paired ‘t’ value on Pre test, Post test scores of Knee Function in Group B have been analyzed and presented in Table 5.

Table: 5

Measurement	Mean	Mean Difference	StandardDeviation	Paired ‘t’ value
Pretest	55.9	20.8	6.22	7.87
post test	35.1			

The calculated paired ‘t’ value for Knee Function in Group B is 7.87. The paired ‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated paired ‘t’ value is more than ‘t’ table value, there is significant difference in Pre and Post test scores of Group B. Thus there is significant improvement in knee function following Shortwave Diathermy with Quadriceps exercises among Osteoarthrosis knee pain subjects.

Figure: 9 Graphical representation of Pre test Mean, Post test Mean and Mean Difference score of Knee Function in Group B.



4.7. Data Analysis of Knee Function of Group A and Group B

Subjects in Group A and Group B were given Mulligan's Rotation Mobilization with Movement along with Quadriceps Exercise and Shortwave Diathermy with Quadriceps exercise respectively for seven days and Pre-test, Post-test scores were recorded and statistically analyzed as follows.

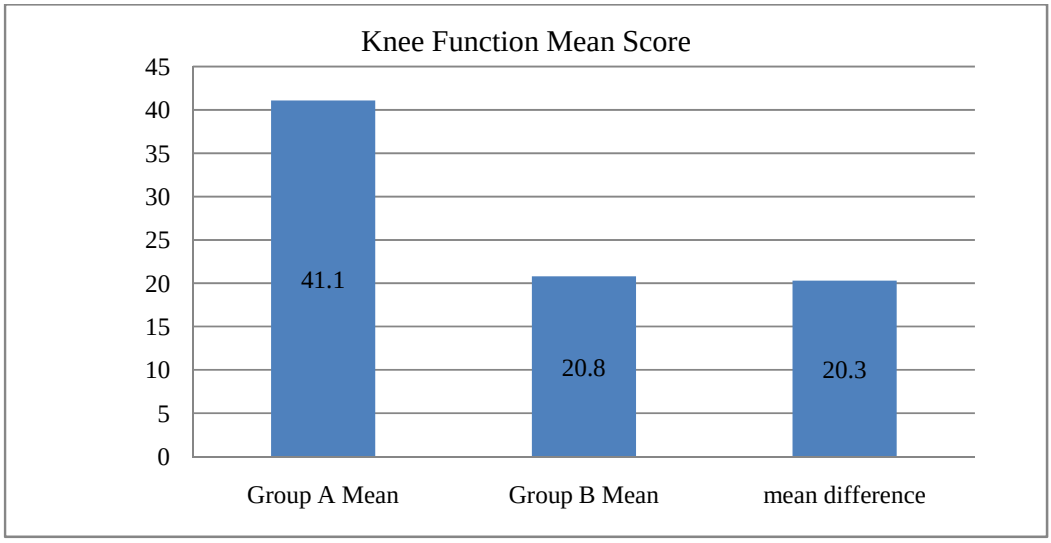
The Mean, Mean Difference, Standard Deviation and Unpaired 't' values of Knee Function in Group A and Group B have been analyzed and presented in Table 6.

sTable: 6

S. No	Groups	Improvement		Standard Deviation	Unpaired 't' test
		Mean	Mean Difference		
1.	Group A	41.1	20.3	9.04	6.331
2.	Group B	20.8			

The calculated Unpaired 't' value for Knee Function of Group A with Group B is 6.331. The Unpaired 't' table value is 2.878 at 0.005 level of significance. Since the calculated Unpaired 't' value is more than 't' table value, there is significant difference in Knee Function score of Group A with Group B. Thus there is significant difference between Group A and Group B in improving Knee Function among Osteoarthrosis knee subjects.

Figure: 10 Graphical representation of Mean and Mean difference of Knee Function values of Group A and Group B.



4.8. Results

The number of subjects for the study was 20(N=20).The subjects were divided into two groups , Group 'A' and Group 'B', each group consisting of 10 subjects. Total treatment program was for a period of 7 days at approximately 30 minutes per session each day. Before the treatment started Group A and Group B were involved for pre-test assessment by Visual Analogue Scale (VAS) for pain and Western Ontario McMasters Universities Osteoarthritis Index for Knee Function. Post-test assessments were repeated after the treatment for both the Groups. Group A was treated with Mulligan's Rotation Mobilization with Movement (MWM) along with Quadriceps Exercises and Group B was treated with Shortwave Diathermy with Quadriceps Exercises.

The calculated paired 't' value for Knee Pain in Group A is 17.20 and Group B is 12.64. The 't' table value is 3.250 at 0.005 level of significance. Since the

calculated ‘t’ value is more than ‘t’ table value, there is significant difference in Pre and Post test scores of Pain in Group A and Group B. Thus there is significant reduction in Knee Pain following Mulligan’s Rotation Mobilization with Movement along with Quadriceps exercises and Shortwave Diathermy with Quadriceps exercises among Osteoarthrosis knee subjects.

The calculated paired ‘t’ value for Knee Function in Group A is 11.62 and Group B is 7.87. The ‘t’ table value is 3.250 at 0.005 level of significance. Since the calculated ‘t’ value is more than ‘t’ table value, there is significant difference in Pre and Post test scores of Knee Function in Group A and Group B. Thus there is significant improvement in Knee Function following Mulligan’s Rotation Mobilization with Movement along with Quadriceps exercises and Shortwave Diathermy with Quadriceps exercises among Osteoarthrosis knee subjects.

The calculated Unpaired ‘t’ value of Knee Pain of Group A and Group B is 5.525 and Knee Function of Group A and Group B is 6.331. The ‘t’ table value is 2.878 at 0.005 level of significance. Since the calculated Unpaired ‘t’ value is more than ‘t’ table value, there is significant difference in Knee Pain and Knee Function score among Group A and Group B. Thus there is significant difference between Group A and Group B in reducing Knee Pain and Improving Knee Function among Osteoarthrosis knee subjects. So we accept Alternate hypothesis H_{A1} and H_{A2} and reject Null hypothesis H_{01} and $H_{02.}$

V CONCLUSION

5.1 Conclusion:

A Pre-test, Post-test Experimental study was conducted to compare the effect of Mulligan's Rotation Mobilization with Movement along with Quadriceps Exercises and Shortwave Diathermy with Quadriceps Exercises in improving knee function in patients with knee Osteoarthrosis.

20 subjects with Osteoarthrosis Knee were included in this study by Consecutive sampling and randomly assigned to two groups as Group A and Group B consisting of 10 subjects each. Group A was treated with Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises and Group B was treated with Shortwave Diathermy with Quadriceps exercise. Knee Pain and Knee Function were assessed before and after the intervention by Visual Analogue Scale (VAS) and Western Ontario McMaster Universities of Osteoarthritis Index (WOMAC).

When comparing the Pain mean values of Group A and Group B. Group A subjects who received Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises showed more difference than Group B who received Shortwave Diathermy with Quadriceps exercises.

When comparing the Knee Function mean values of Group A and Group B. Group A subjects who received Mulligan's Rotation Mobilization with Movement along with Quadriceps exercises showed more difference than Group B who received Shortwave Diathermy with Quadriceps exercises.

Hence it is concluded that Mulligan's Mobilization with Movement along with Quadriceps exercises is more effective than Shortwave Diathermy with Quadriceps exercises in reducing pain and improving knee function in Osteoarthrosis knee subjects.

5.2 Limitations

The study was conducted with a sample size of 20, the age group of the sample being 45 to 55 years with treatment duration of 7 days.

5.3 Recommendations

Future research can be conducted with a bigger sample size, wider age group, different variables, more consistent outcome measures and different treatment durations.

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ANNEXURE 7.1

ASSESSMENT CHART

Physical therapy assessment chart

Name

Age

Gender

Occupation

Chief complaints

Medical history

- Past
- Present

Family history

Social history

Associated problems

On observation

- Body Built
- Posture
- Attitude of limbs
- Muscle wasting
- Edema
- Involuntary movement
- Gait

- Deformity

On palpation

- Tenderness
- Swelling
- Muscle tightness
- Warmth
- Other if any

Pain assessment

- Side
- Site
- Duration
- Nature
- Aggravating factor
- Relieving factor
- Other if any

On examination

- Vital signs
- Motor Assessment
    - Range Of Motion
    - End Feels
    - Manual Muscle Testing
    - Joint Positions
- Sensory Assessment
    - Superficial Sensations
    - Deep Sensations
    - Combined

- Reflexes
    - Superficial
    - Deep
    - Clonuses
- Dermatomes and Myotomes
- Limb Length Discrepancies
- Special Tests
- Functional Assessments
- Gait Assessments

Investigations

Clinical Impression

Differential Diagnosis

Final Diagnosis

Goals

- Short Term Goals
- Long Term Goals

Treatment Plan

- Electrotherapy Modalities
- Manipulations
- Exercise Therapy
- Splints and Assistive Devices

Home Programme

Table: 7.2 (a) Pre and post-test Visual Analog Scale values of Pain among Group A

Serial no.	Pre Test	Post Test	Difference (d)	Difference squared (d^2)
1	7	2.5	5.5	30.25
2	8.5	3	5.5	30.25
3	9	3	6	36
4	7.5	2.5	5	25
5	6	1	5	25
6	4	1	3	9
7	5	1.5	3.5	12.25
8	9.5	4	5.5	30.25
9	8	3.5	4.5	20.25
10	7.5	2	5.5	30.25

Table: 7.2 (b) Pre and post-test Visual Analog Scale values of Pain among Group B

Serial no.	Pre Test	Post Test	Difference (d)	Difference squared (d^2)
1	7.5	3.5	4	16
2	6.5	4.5	2	4
3	8	5	3	9
4	7	4	3	9
5	5.5	3	2.5	6.25
6	9.5	6	3.5	12.25
7	8.5	5	3.5	12.25
8	6	4	2	4
9	4	2	2	4
10	6.5	4	2.5	6.25

Table 7.3 (a): Pre test and Post test Western Ontario McMasters universities Osteoarthritis Index scale value among Group A

Serial no.	Pre Test	Post Test	Difference (d)	Difference squared (d^2)
1	53	12	41	1681
2	71	24	47	2209
3	79	28	51	2601
4	64	23	41	1681
5	45	12	33	1089
6	34	10	24	576
7	32	9	23	529
8	73	25	48	2304
9	84	28	56	3136
10	65	18	47	2209

Table 7.3 (b): Pre test and Post test Western Ontario McMasters universities Osteoarthritis Index scale value among Group B

Serial no.	Pre Test	Post Test	Difference (d)	Difference squared (d^2)
1	52	44	8	64
2	44	33	11	121
3	59	50	9	81
4	48	34	14	196
5	34	22	12	144
6	71	49	22	484
7	63	43	20	400
8	53	27	26	676
9	28	16	12	144
10	54	33	21	441

ANNEXURE 7.4

WOMAC Osteoarthritis Index LK3.1 (1K)

INSTRUCTIONS TO PATIENTS

In Sections A, B and C questions are asked in the following format. Please mark your answers by putting an "**X**" in one of the boxes.

EXAMPLES:

1. If you put your "X" in the box on the far left as shown below,

   None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐

   Then you are indicating that you feel no pain.

2. If you put your "X" in the box on the far right as shown below,

   None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐

   Then you are indicating that you feel **extreme** pain.

3. Please note:

   a) That the further to the right you place your "**X**", the **more** pain you feel.

   b) That the further to the left you place your "**X**", the **less** pain you feel.

   c) **Please do not** place your "**X**" **outside any of the boxes**.

You will be asked to indicate on this type of scale the amount of pain, stiffness or disability you have felt during the last 48 hours.

Think about your knee to be injected when answering the questions. Indicate the severity of your pain and stiffness and the difficulty you have in doing daily activities that you feel are caused by the arthritis in your knee to be injected.

Your knee to be injected has been identified for you by your health care professional. If you are unsure which knee is to be injected, please ask before completing the questionnaire?

WOMAC Osteoarthritis Index LK3.1 (1K)

Section A

PAIN

Think about the pain you felt during the last 48 hours caused by the arthritis in your knee to be injected.

(Please mark your answers with an "**X**")

QUESTION: **How much pain have you had . . .**	Study Coordinator Use Only
1. When walking on a flat surface? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PAIN 1 _____
2. When going up or down stairs? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PAIN 2_____
3. At night while in bed? (that is pain that disturbs your sleep) None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PAIN 3_____
4. While sitting or lying down? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PAIN 4_____
5. While standing? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PAIN 5_____

WOMAC Osteoarthritis Index LK3.1 (1K)

Section B

STIFFNESS

Think about the stiffness (not pain) you felt during the last 48 hours caused by the arthritis in your knee to be injected.

Stiffness is a sensation of **decreased** ease in moving your joint.

(Please mark your answers with an "**X**")

	Study Coordinator Use 0nly
6. How **severe** has your stiffness been **after you first woke up** In the morning? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	STIFF 6_____
7. How **severe** has your stiffness been after sitting or lying down Or while resting **later in the day**? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	STIFF 7_____

WOMAC Osteoarthritis Index LK3.1 (1K)

Section C

DIFFICULTY PERFROMING DAILY ACTIVITIES

Think about the difficulty you had in doing the following daily physical activities during the last 48 hours caused by the arthritis in your knee to be injected. By this we mean **your ability to move around and take care of yourself**.
(Please mark your answers with an "**X**")

QUESTION: **How much difficulty have you had . . .**	Study Coordinator Use Only
8. When going down the stairs? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 8_____
9. When going up the stairs? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 9_____
10. When getting up from a sitting position? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 10_____
11. While standing? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 11_____
12. While bending to the floor? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 12_____
13. When walking on a flat surface? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 13_____

WOMAC Osteoarthritis Index LK3.1 (1K)

DIFFICULTY PERFROMING DAILY ACTIVITIES

Think about the difficulty you had in doing the following daily physical activities during the last 48 hours caused by the arthritis in your knee to be injected. By this we mean **your ability to move around and take care of yourself**.

(Please mark your answers with an "**X**")

QUESTION: **How much difficulty have you had . . .**	Study Coordinator Use Only
14. Getting in or out of a car, or getting on or off a bus? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 14_____
15. While going shopping? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 15_____
16. When putting on your socks or panty hose or stockings? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 16_____
17. When getting out of bed? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 17_____
18. When taking off your socks or panty hose or stockings? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 18_____
19. While lying in bed? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 19_____

WOMAC Osteoarthritis Index LK3.1 (1K)

DIFFICULTY PERFROMING DAILY ACTIVITIES

Think about the difficulty you had in doing the following daily physical activities during the last 48 hours caused by the arthritis in you knee to be injected. By this we mean **your ability to move around and take care of yourself**.

(Please mark your answers with an "**X**")

QUESTION: **How much difficulty have you had . . .**	Study Coordinator Use Only
20. When getting in or out of the bathtub? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 20 _____
21. While sitting? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 21_____
22. When getting on or off the toilet? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 22_____
23. While doing heavy household chores? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 23_____
24. While doing light household chores? None ☐ mild ☐ moderate ☐ severe ☐ extreme ☐	PFTN 24_____

ANNEXURE 7.5

PATIENT CONSENT FORM

I ……aged……yrs, voluntarily consent to participate in the research named **"A Comparative study on Effectiveness of Mulligan's Rotation Mobilization with Movement (MWM) versus Deep Heating Modality along with Quadriceps exercises in the management of Osteoarthrosis knee subjects."**

The researcher has explained me the treatment approach in brief, risk of participation and has answered all the questions pertaining to the study to my satisfaction.

Signature of Subject **Signature of Researcher**

Signature of Witness